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ABSTRACT

Five pilot studies were conducted at four two-year colleges in the Washington, D.C. area during the 1970-71 academic year to identify relevant variables for subsequent in-depth examination in this USOE-funded research project which is designed to determine student acceptance and learning effectiveness of microform. Known as Phase II, the year's activities consisted of developing procedures and instruments, evaluating microform equipment, preparing and packaging microform materials, and testing the effects of selected variables that are potentially critical to student acceptance and learning. Phase I (see ED 040 708) sought to (1) identify common courses and programs in community colleges nationally, (2) develop a bibliography for each area, and (3) provide a plan for conducting the study, itself. In Phase II, the examined variables were (1) mode, (2) access, (3) content, (4) format, and (5) image polarity. Experimental students evidenced little resistance to microforms--either roll film or microfiche. It was found that microfiche acceptance is not differentially affected by the above five factors. Data confirmed that students who used learning resource materials in microform learned as well as students who utilized traditional hardcopy materials. (Author/CK)

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Final Report
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A Research Project to Determine the Student Acceptability and Learning Effectiveness of Microform Collections in Community Junior Colleges: Phase II

Dale Gaddy

American Association of Junior Colleges

Washington, D.C. 20036

June 1971

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FINAL REPORT
Contract No. OEC-0-9-180260-3703-(095)

A RESEARCH PROJECT TO DETERMINE THE STUDENT ACCEPTABILITY AND LEARNING EFFECTIVENESS OF MICROFORM COLLECTIONS IN COMMUNITY JUNIOR COLLEGES: PHASE II

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For their willingness to experiment, we acknowledge the students, faculties, and administrations of the four two-year colleges that participated in the second phase of the Microform Project's activities. Special thanks also is extended to the microform companies that contributed or loaned equipment and materials to the project; to the members of the Advisory Committee for their guidance and assistance; and to the U.S. Office of Education for financing this study.

Microform Project Staff

ABSTRACT

Title of Project: A Research Project to Determine the Student Acceptability and Learning Effectiveness of Microform Collections in Community Junior Colleges: Phase II

Amount of Federal Funds Requested: $118,488

Duration of Project: 1 June 1970 to 31 May 1971

Five pilot studies (three experimental and two demonstration) were conducted at four two-year colleges in the Washington, D.C. area during the 1970-71 academic year to identify relevant variables for subsequent in-depth examination in this USOE-funded research project which is designed to determine student acceptance and learning effectiveness of microform. Known as Phase II, the year's activities consisted of developing procedures and instruments, evaluating microform equipment, preparing and packaging microform materials, and testing the effects of selected variables that are potentially critical to student acceptance and learning.

The examined variables were (1) mode--the action the user must perform in order to be presented with a readable image of the information stored in various microforms (such as roll film, more than one microfiche per reference, one microfiche per reference, and more than one reference per microfiche), (2) access--the availability of microform equipment and materials under restricted (library only) or free (library and home) conditions, (3) content--the type of subject matter content ("essay," as in literature and history, and "display," as in mathematics and geology), (4) format--the physical sequence of frame presentation (vertical or horizontal) and (5) image polarity--positive and negative film.

Although no generalizable conclusions were drawn in this phase of the project's research, experimental students evidenced little resistance to microforms--either roll film or microfiche--and, in fact, were largely favorable in their acceptance. Equally important, it was found that microform acceptance is not differentially affected by the above five factors.

The question of learning effectiveness was also answered positively. Data confirmed that students who used learning resource materials in microform learned as well as students who utilized traditional hardcopy materials.

CHAPTER I

Background for the Study

A. The Problem and Objectives

Microform[1] technology dates at least to 1839 when J. B. Dancer, an English scientist, reduced a twenty-inch document to an image one-eighth inch in length which was visible under a 100X microscope.[2] Its utility was dramatically shown during the Siege of Paris (1870) when military documents were reduced to rolls of microfilm that were flown over enemy lines via carrier pigeons.[3] By the 1920's, commercial use of microforms began to grow in the United States, primarily as a result of the banking industry's turning to microfilm as an efficient and economical means of recording cancelled checks.[4] Micro-reproduction[5] and micropublication[6] became widespread during World War II, especially in the armed forces and governmental agencies of the United States. Eventually other segments of American society, including education, began turning to microform technology as a means of streamlining their operations.

A few of the potentialities of microforms that would seem to enhance their use in educational institutions include (1) a reduction in initial capital outlay, (2) a reduction in storage space, (3) a

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[1] Microform is a generic term that includes various forms of miniaturized photographs (usually of newspapers, books, journals, charts, maps, etc.) either on film or paper. Common microforms are (1) microfilm--a roll of film containing a series of images, (2) microfiche--a sheet of film containing micro-images arranged in a grid pattern, (3) aperture cards--cards containing one or more frames of microfilm, and (4) microcards--sheets of opaque material containing micro-images.

[2] The White Rabbit (Wooster, Ohio: Bell & Howell, n.d.), p. 3.

[3] Ibid.

[4] Carl E. Nelson, Microfilm Technology (New York: McGraw-Hill Book Company, 1965), p. 1.

[5] Defined by Nelson, loc. cit., p. 382, as "Copy rendered in sizes too small to be read by the unaided eye. They may be produced photographically or by other means on either transparent or opaque materials...." Micro-reproduction refers to the copying of a publication that originally appeared in hardcopy (print).

[6] The publication of a new work in microform.

reduction in retrieval time, (4) an increase in collection integrity, and (5) an increase in availability of learning resources. An example of savings made possible by microform include a 100-page ERIC[7] document available in hardcopy for $3.29 or in microfiche for $0.65.[8]

Storage space can be reduced by 98 percent or more when materials are published in or converted to microform.[9] According to one advertisement claim, the millions of books now stored on the 270 miles of shelving at the Library of Congress could be converted to microforms requiring no more than six standard filing cabinets for storage.[10] By reducing the distance one must cover in locating a desired document--especially with the aid of automation--retrieval time can be reduced significantly. The removal of or damage to pages in microform is far less likely than in hardcopy, thus increasing the likelihood of finding a complete document rather than a partial document. With equipment for printing or duplicating on demand, hardcopy pages may be copied from microforms, or entire documents may be duplicated in microform, thus making possible guaranteed access to holdings of a library or bookstore. Moreover, with portable equipment, it is possible to transport large quantities of resource materials more easily than comparable hardcopies.

The advantages of microforms notwithstanding, little use has been made of this technology in education other than for archival purposes (e.g., the storage of historical and financial records, the preservation of theses and dissertations, and the procurement of out-of-date or out-of-print publications of use primarily to researchers). Rarely have microforms been used as a means of learning. This may be attributed to the lack of relevant materials in microform, the absence of inexpensive magnifying equipment (readers), the multiplicity of software and hardware (thus complicating the identification and selection of appropriate microforms for educational use), and a reluctance to enter into a non-conventional means of extending the learning resources of an institution. There are indications, however, that in recent years educational institutions have been approaching a point

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[7]Educational Resources Information Center, a U.S. Office of Education project to collect and disseminate educational research reports.

[8]Even greater savings accrue for longer documents. A 400-page document sells for $13.16 in hardcopy but remains at the $0.65 price in microfiche.

[9]Joseph L. Kish, Jr. and James Morris, Microfilm in Business (New York: The Ronald Press, 1966), p. 4.

[10]"The Smallest Bible in the World," The National Cash Register Company, Dayton, Ohio.

of readiness to accept (or even generate) microforms for academic use.

To a large extent, the shift in interest among educators has been economically motivated. The post-World War II "baby boom" caused school and college enrollments to increase rapidly during the 1950's and 1960's, necessitating the expansion of existing facilities or the construction of new ones, and requiring greater efficiency in the use of facilities, equipment, and materials. A second factor has been the "information explosion" that has placed increased demands on the acquisition and storage of new materials. The prospects of purchasing more materials for less outlays of monies and storing more resources in existing facilities undoubtedly have lured educators to the field of microform technology. Still another reason, particularly among community junior colleges,[11] has been the trend toward extending the learning resources to persons beyond the bounds of the campus. An "exportable" library of microforms could be used in extension classes, for research and recreational purposes off-campus, and by individuals who could not otherwise gain access to materials restricted to campus use.

Yet, many fundamental questions about microforms remain unanswered. Is microform, in fact, a suitable medium for transferring knowledge? Will students, teachers, and others who are served by educational institutions accept and utilize microforms, and, if so, will they learn as well from this medium as from more traditional ones? In the absence of reliable answers to such questions as these, intensive and extensive introductions of microforms in education will be impeded.

In consequence, the American Association of Junior Colleges with a grant from the United States Office of Education launched a multiple-year research project in 1969 to determine the efficacy of microforms in education. The major objectives of the study are:

(1) To determine under what conditions or circumstances people will use microforms, and

(2) To determine whether people can learn as well from microforms as from standard books and other publications.

Considering the heterogeneity of community college enrollees--their ages (ranging from at least 17 to 70 years), their interests (including occupational, vocational, and professional), and their abilities (falling within all quartiles of the more commonly administered standardized tests and/or high school grades)--the findings of this investigation should have implications for most adults in the

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[11] Hereinafter referred to as community colleges.

United States. Moreover, should the study result in conclusive evidence that users learn at least as well from microforms as from original sources, both the demand for and supply of appropriate microforms in education should increase with benefits accruing for persons at all levels of education and of all economic and social backgrounds--especially the disadvantaged and the minorities who all too often can least afford the more expensive hardcopy versions of printed material.

At the time of its inception, the study was projected over a three phase period, the second of which is the subject of this report.

B. Personnel

The project staff consists of a director, a research specialist, and a secretary. Serving as director is Dale Gaddy who holds B.S. and M.A. degrees from Appalachian State University and the Ed.D. from Duke University. He has done postdoctoral work at the University of California, Los Angeles. A former teacher and secondary school administrator, Dr. Gaddy served as an editor and research specialist with the ERIC Clearinghouse for Junior Colleges prior to joining the American Association of Junior Colleges in June 1970.

Aikin Connor, research specialist, earned his bachelor's degree at Southwest Texas State, his master's degree at the University of Kentucky, and his doctorate at the University of the Pacific. A postdoctoral scholar at UCLA and a former research specialist with the ERIC Clearinghouse for Junior Colleges, Dr. Connor has had extensive research and teaching experience at all levels of education. He joined the project staff in June 1970.

Lisabeth Horner, secretary, received the B.A. degree at Clarion State College in 1970. Miss Horner has been with the project since August 1970.

The 1970-71 Advisory Committee consisted of the following persons:

--Dr. Jordan Baruch, Graduate School of Business, Harvard University;

--Mrs. Louise Giles, Dean of the Learning Resources Center, Macomb County Community College, Warren, Michigan;

--Mr. John Herbst, Head Librarian, Penn Valley Community College; Kansas City, Missouri;

--Mr. James Kottenstette, Director, Denver Research Institute, University of Denver;

--Mr. Paul Millane, Director, Junior and Senior College Division, American Education Publisher's Institute, New York City;

--Mr. James Prevel, President, Educational Information Services, Inc., Washington, D.C.;

--Dr. John E. Roueche, Chairman, Junior College Program, University of Texas;

--Mr. Carl Spaulding, Project Officer, Council on Library Resources, Washington, D.C.;

--Dr. Vernon Tate, Executive Director, National Microfilm Association, Silver Spring, Maryland;

--Dr. Richard Wilson, Acting Associate Executive Director, American Association of Junior Colleges, Washington, D.C.

C. Facilities

Office space for the project staff was provided by the American Association of Junior Colleges located at the National Center for Higher Education in Washington, D.C. Also available were a conference room, the facilities of the AAJC library, a duplication room, a shipping and receiving room, and storage areas. Other facilities within the NCHE building of special value to the project personnel were libraries of the American Council on Education, the Council on Library Resources, and the ERIC Clearinghouse on Higher Education. The National Education Computer Center, located in the same building, further extended the facilities available to the project.

Additionally, ample storage and utility space was provided at each of the four community colleges that participated in the Phase II pilot studies.

D. Review of Phase I

Although Phase I of this study has been described in detail in a previous report,[12] a review of the 1969-70 activities may serve as

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[12]Louise Giles, "A Research Project to Determine the Student Acceptability and Learning Effectiveness of Microform Collections in Community Colleges: Phase I," (Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, June 1970), 244 pp., available as document number ED 040 708 from ERIC Document Reproduction Service, Leasco Information Products, Inc., 4827 Rugby Avenue, Bethesda, Maryland 20014 for $9.87 in hardcopy or $0.65 in microfiche.

a useful preface to the Phase II report. Phase I was directed by Mrs. Louise Giles of Oakland Community College (Michigan). Its proposed objectives were (1) to identify common courses and programs in community colleges, nationally, (2) to develop a bibliography for each area, and (3) to provide a plan for conducting the study, itself.

Seven courses were identified as "high-enrollment" courses in community colleges. These were: art appreciation, economics, English, life science (ecology), mathematics, political science, and psychology. Three other courses were added: nursing (to represent a vocational-technical course), Spanish (to represent a language course), and black studies (to represent a new and innovative course offering).

A team of subject specialists was selected to prepar bibliographies for the ten courses. The completed bibliographies consisted of 4,166 entries which were identified as "required," "recommended," or "available" resources.

Plans for Phase II were formulated. These included the selection of personnel and the development of a preliminary research design. With reference to the latter, the Center for Research on Learning and Teaching (Ann Arbor, Michigan) and the Behavioral Science Corporation (Washington, D.C.) were consulted; information amassed from these sources as well as from the Phase I Advisory Committee was relayed to Dr. Connor of the University of California at Los Angeles who prepared an overview of the research problem and a tentative research design.

At the end of Phase I, the project director (Mrs. Louise Giles) mailed all files and reports to AAJC where the project then became centered.

CHAPTER II

Phase II Methods and Activities

The proposal for Phase II (dated February 4, 1970) made the assumption that the design for Phase III would be developed early in the second phase and tested out at the same institutions that subsequently would take part in the Phase III activities. This, however, did not prove to be feasible, as it became apparent that the significant variables of relevance to the overall research issues were not likely to be the courses of studies, per se, but the different kinds of microforms being used. Hence, a group of pilot studies was designed, some of which were demonstration studies. Because of the possibilities of contaminating the field tests of Phase III (which would be structured on the basis of findings to the pilot studies), it was thought that a more realistic and sound approach would be to work with different colleges in Phases II and III. The Phase II sample was limited to colleges in or near the District of Columbia (where AAJC is located) in order to economize staff time and project resources.

This chapter gives an overview of the methods used and activities that transpired during Phase II.

A. Methods

Methods employed during Phase II may be classified as (1) administrative and (2) research.

1. Administrative

Upon assuming the roles of director and research specialist, Dr. Gaddy and Dr. Connor communicated in person or by mail with the Advisory Committee, AAJC personnel, USOE officials, and more than three hundred microform hardware or software producers throughout the country. Two-year colleges in the Washington, D.C. vicinity were visited in terms of possible involvement in one or more of the Phase II pilot studies. On-site visits were made to selected microform firms to preview equipment, photography laboratories, and processing operations. Arrangements were made with various manufacturers to borrow (at no cost to the project) a variety of equipment and microform collections, the total retail price of which (including free services) exceeded $60,000. Progress reports were made to the professional staff at AAJC at various intervals throughout the year. Articles and news releases were prepared for publication and speeches were given at various conferences to publicize the project's activities. Interim reports detailing the specifics of such methods and activities were prepared and submitted to USOE on a quarterly basis.

2. Research

Methods directly related to research included a survey of related research reports and publications in an attempt to become further familiar with the field of microform technology; the planning and conducting of pilot studies (experimental and demonstration); and the evaluation of data.

B. Activities

In the language of the Phase II proposal, the following activities were projected for Phase II:

> 1) complete the research design for Phase III; 2) identify the community junior colleges that will be involved in the field study; 3) determine the courses that will be involved at each college participating in the field study; 4) select the media that will be used at each college from the bibliographies prepared in Phase I; 5) decide what media should be available in microform and in standard form at each college; 6) obtain permission to present specific media in microform; 7) select the hardware that will be used in the field study; 8) determine the quantities of software and hardware to be used at each college; 9) obtain sufficient quantities of software and hardware; 10) develop the procedures and forms for collecting and reporting the data; 11) locate the media and hardware at each college in accordance with the research design; 12) select and train the people who will conduct the field study; 13) conduct trial runs at the colleges; 14) evaluate the procedures and results of the trial runs; and 15) make final adjustments in the research design, field situations, procedures, reporting forms, and personnel.

As explained in the opening paragraph of this chapter, changes were made in the directions of the year's work, resulting in twenty-nine activities rather than fifteen. These are described in detail in the remainder of this chapter. Their order of presentation does not necessarily reflect the order in which they were begun or completed; in fact, many of the activities were in progress simultaneously. Three of the activities (the pilot studies, data analyses, and final adjustments) receive expanded treatment in Chapter III of this report.

1. Completion of Research Design for Pilot Studies

Increased familiarity with the background and parameters of the project's objectives as well as a developing insight into some of the intricacies and subtle demands of the research problems led to the formulation and conceptualization of a design for the Pilot Studies which differed from the tentative plan offered in the Phase I report. A group of pilot studies to investigate the significance of hardware and software design was developed on the premise that the important variables of the study were predicated on man-machine interactions rather than subject matter. The design thus developed in Phase II stemmed from the point of view of the student-user and reflected attempts to formalize and categorize the myriad details relating to his use of microforms into quantifiable variables. Five variables[13] were believed operative. These were:

a. Mode--the action the user must perform in order to be presented with a readable image of the information stored in various microforms; also, the means by which the reader stores in his mind the physical location of specific information (e.g., a formula). The modes included in the study were: I--reel (microfilm), II--more than one microfiche per reference, III--one microfiche per reference, and IV--more than one reference per microfiche.[14]

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[13]Consideration was given to the possibilities of including two additional variables: experience with microforms and cost of microforms. Because of the nature of assessing experience (i.e., the degree to which resistance to microforms is reduced as familiarity with their use is gained), it was decided to investigate its effects post hoc rather than experimentally; therefore experience was deleted as an operative variable. The factor of microform cost to the student was deleted due to the difficulty in executing the necessary manipulations within ethical bounds. Hence, the number of variables identified for manipulation was five.

[14]An underlying assumption, supported by Kottenstette's findings is that discrepancies among projected images are related to unique models of readers rather than to reduction ratio. Thus, the relevant differences would be those concerning the physical manipulation of the machine and the mental image of the actual storage of information (e.g., recollection of a chart near the top row, last column of a fiche). See James P. Kottenstette, An Investigation of the Characteristics of Ultrafiche and its Applications to Colleges and Universities, (Denver, Colorado: Denver Research Institute, August 31, 1969). pp. 23-28.

b. Access--the accessibility to the user of equipment and microform materials. Two levels were studied--restricted access (library only) and free access (library and home).[15]

c. Content--the type of subject matter content involved in the microform-user transaction. The two extremes studied were "essay" (e.g., history and literature) and "display" (e.g., mathematics and geology).[16]

d. Format--the physical sequence of frame presentation--vertical or horizontal.[17]

e. Image polarity--positive (identical with original tonal values) and negative (reversed from original).[18]

The five independent variables were considered categorically; all analyses followed fixed-effect models.

Two criterion variables or dependent variables were considered: student acceptance and student learning. Acceptance was operationalized by two measures--one to indicate a degree of positive or negative attitude toward microforms and another to indicate actual use of microforms. The instrument designed to assess attitude allowed comparisons to be made with the use of hardcopy and controlled for confounding factors such as attitudes toward reading, the specific course, and education in general. The use of microforms was measured by means of library records and timing devices (clocks), the latter of which were attached to selected microform readers.

(Available from ERIC as document number ED 032 447 for $9.87 in hardcopy or $0.65 in microfiche.

[15]The possibility that this factor may be critical is confirmed in a study by Ralph W. Lewis entitled "User's Reaction to Microfiche--a Preliminary Study." See College and Research Libraries (July 1970), pp. 260-268.

[16]The relevance of this factor is suggested by Kottenstette who concluded, "...the information communicated must be substantive and make demands on the user in order to minimize the user's concern with the reader and detailed aspects of its performance." See Kottenstette, op. cit., pp. XIV.

[17]Format is either vertical (cine) or horizontal (comic strip).

[18]Polarity is either positive or negative. Neither format nor polarity has been researched extensively or conclusively from an academic viewpoint.

Student learning was measured in terms of overall grades in the courses. Where comparisons with users of traditional materials were made, controls were utilized within each class in order to avoid the confounding of the variable by differences among schools and/or teachers.

The design of the studies is presented in Chapter III as well as the analysis of the data collected and interpretations of the findings.

2. Adjustment of Contract and Budget

In view of the completion date of Phase I and the revision of the tentative research design as described above, the beginning and ending of the Phase II contract as well as the allocation of approved funds were adjusted. Initially, Phase I was to have ended in April 1970; however, for reasons presented in the final report of Phase I, that phase was continued through May 1970. Phase II commenced June 1, 1970. A request was submitted to the project officer at USOE for approval to change the Phase II contract dates from April 11, 1970-April 10, 1971 to June 1, 1970-May 31, 1971. The Contracts and Grants Division of USOE indicated that approval of this request would be granted upon the endorsement of the project officer.

Without increasing the total of the budget for Phase II, the director requested adjustments in four categories and the creation of an additional category. The affected categories are shown in Table 1.

As a means of explanation, it was pointed out in the letter of request that (1) the estimated budget for office supplies and expenses was below the projected total for the year (based on figures for June, July, and August 1970), (2) the leasing of reader-printers had been ruled out inasmuch as the capability to produce hardcopy from microform would, in effect, negate the central purpose of the study, (3) a review of estimates to lease equipment reflected a need for $3,330 additional funds for table model readers and a $400 over-estimate of the funds required to lease portable readers, (4) $14,920 had been estimated as a sufficient sum for producing Phase II microforms, thus freeing $7,580 for diversion to other categories, (5) allowance should be made for data processing in the amount of $1,500, and (6) the net effect of the proposed changes would be a savings of $373 to USOE, derived from the formula for overhead (19.3% of the expenditures excluding equipment leases).

3. Identification of Community Colleges for Phase II

In attempting to identify colleges that would be desirable for inclusion in Phase II, proximity to AAJC headquarters was a prime factor. (Identification of Phase III colleges came later in

TABLE 1

ORIGINAL PHASE II BUDGET		ADJUSTED PHASE II BUDGET*	
Office Supplies and Expenses			
Supplies, Publications, and Materials	$1,000		$2,500
Telephone	1,000		2,500
Postage	100		1,000
Printing Costs	750		1,000
Total	$2,850	Total	$7,000
Equipment Leasing			
Reader-printers	$1,000		$ 0
Table Model Readers	400		3,730
Portable Readers	2,500		2,100
Total	$3,900	Total	$5,830
Microform Production	$22,500		$14,920
Total	$22,500	Total	$14,920
Data Processing	$ 0		$ 1,500
Total	$ 0	Total	$ 1,500
Administrative Services	$18,538		$18,155
Total	$18,538	Total	$18,155

*Not affected were the categories relating to salaries, travel, and consultants.

the year and is described in a subsequent section of this chapter.) Additional determining factors were: interest in the project; the willingness of the administration, faculty members, and students to participate in the research activities; and the availability of space for equipment and materials. Four colleges were identified after discussions with administrators and faculty. These were: Washington Technical Institute (Washington, D.C.), Mount Vernon College (Washington, D.C.), Montgomery College (Rockville, Maryland), and Northern Virginia Community College (Bailey's Crossroads, Virginia). This sample provided one predominantly Black institution (Washington Tech) featuring programs geared toward vocational and technical interests; one private (non-sectarian), residential college (Mount Vernon); and two comprehensive commuter colleges (Montgomery and Northern Virginia).

4. Selection of Courses

Courses were selected with the advice and assistance of college officials at each institution. Primarily, the project staff was interested in identifying teachers who would be willing to participate, of their own free will, in an experiment; who required rather substantial reading assignments in their courses; and who had no extreme aversion to or affection for microforms. After compiling a list of possible classes at each institution, careful attention was given to the specific pilot studies that had been proposed; those teachers whose courses appeared to fit a particular pilot study were then invited to participate, with the understanding that students would be advised of the experimental nature of the course prior to or at the time of registration. The selected courses were:

American History--Northern Virginia
Shakespeare--Mount Vernon
Anatomy and Physiology II, and Chemistry for Nurses--Washington Tech
Child Psychology and Physical Geology--Montgomery

5. Identification of Software

The software or media for the various courses were identified according to the design of the particular pilot studies. The reading materials at Northern Virginia were designated for production in both positive and negative microfiche at two different reduction ratios: 18-1 and 32-1. Positive roll film (8mm. loaded in cassettes) was selected for Mount Vernon. Positive high reduction (150-1) ultrafiche was used at Washington Tech in both cine (vertical formatting) and comic strip (horizontal formatting); also used was positive low reduction microfiche. At Montgomery, two distinctly different types of

reading materials (essay and display) were planned for positive roll film (16mm. reels) and low reduction positive microfiche.

6. Identification of Hardware

Hardware appropriate for reading the various types of microforms described above was identified. This was done by means of consulting various publications, by reading brochures received directly from the manufacturers, and by perusing advertisements in the literature. Of special value were the publications edited by Hubbard W. Ballou and entitled Guide to Microreproduction Equipment (Annapolis, Maryland: NMA, 1968) and its supplement, 1970 Supplement to the Guide to Microreproduction Equipment (Silver Spring, Maryland: NMA, 1970).

7. Visitations with Selected Manufacturers of Microform Equipment and Materials

Representatives of various microform equipment and material production firms were invited to the project office for the purposes of reviewing products and explaining the nature of the project. In certain instances, on-site visits of companies were made by the project director and/or research specialist. Firms were invited by mail, phone, or in person to lend one or more models or microform collections to the project for use during Phase II. Twenty-three companies loaned one or more readers, each; eight companies producing software agreed to provide microform collections at no cost to the project. Additionally, three companies offered free film or services. As noted previously, the combined contributions amounted to more than $60,000 worth of hardware, software, or services.

8. Procurement of Bibliographies

Bibliographies of the reading materials normally used by each of the participating teachers were obtained in order that contacts could be made with the appropriate publishers or copyright owners. In all, there were twenty-four sources identified; some of these included articles, chapters, or other sections that were under copyright by more than one publisher or owner. All references were categorized by name of publisher or copyright owner.

9. Solicitation of Copyright Releases

Forty-four publishers or copyright owners were contacted by mail in an attempt to gain permission to film the works relied upon by the pilot study teachers. Follow-up contacts, where necessary, were made by phone. After three months, forty-three publishers had agreed to the

use of their materials in the project's studies with the understanding that the filmed copies would be used for the proposed experiments only, and that sales or other distribution of the filmed materials would not be undertaken by the project. All agreements were in writing.

10. Determination of Required Quantities of Microforms

According to the dictates of the respective pilot study designs and projected enrollments for each of the scheduled classes, the quantities of microforms required for the pilot studies were determined.

11. Placement of Film Orders

Various microfilm companies were contacted with regard to price estimates for filming the materials that had been approved by the publishers or copyright owners. Four companies were contracted to do the filming in a variety of forms.

12. Procurement of Hardware

Hardware desired for use in the pilot studies was selected on the basis of first-hand use or observation by the project staff and in concert with members of the Advisory Committee who had expertise in microform hardware. Many factors were considered in this process, including purchase cost, lease price, weight, dimensions, screen color and angle, magnification ratio, types of flats, and accessories. Orders were placed for sufficient quantities to conduct the pilot studies. Specific brands and models are identified in the descriptions of the respective studies which are presented in Chapter III.

13. Development of Forms, Scales, and Procedures

Forms were developed to record student attitudes and microform usage as were scales of assessment. These are described in detail in Chapter III.

Attention also was given to "procedural forms" which, though not required during Phase II in view of the close proximity of the participating colleges to AAJC, would be desirable for Phase III when the project becomes national in scope. Forms for shipping and receiving equipment and materials, for unpackaging and setting up the microform systems, for maintaining the systems, for reporting data, and for tabulating the circulation and use of microforms were conceptualized.

14. Scheduling of Meetings with Pilot Study Participants

Meetings with administrators, faculty, and students were held at the four campuses to discuss project plans and progress during the year. By and large these sessions were designed to stimulate continued interest and involvement in the project and to enhance communication between the participants and the project staff.

15. Selection and Training of Coordinators

The head librarian at each of the four participating colleges agreed to serve as the project coordinator and was responsible for supervising the equipment and materials that would be distributed to each institution. Also the coordinator was responsible for notifying the project staff of any mechanical or operational difficulties encountered. Sessions were held with each coordinator to introduce the specific type(s) of readers and microforms assigned for a given pilot study.

16. Distribution of Equipment and Materials

Upon receipt of equipment and materials from the various manufacturers or suppliers, the project staff delivered the microform systems to each campus and assisted with the installation.

17. Scheduling Workshops

Workshops were held at each institution for the principle participants. Instructions were given as to the care and use of microforms and a demonstration of the available hardware was given.

18. Conducting the Pilot Studies

The pilot studies were conducted as described in Chapter III. The first Mount Vernon "demonstration" project began January 6 and ended May 31; the Washington Tech study was launched January 11 and terminated March 17; the Northern Virginia study began January 12 and was completed by March 16; the Montgomery study opened on February 1 and closed on May 21; and a second "demonstration" study commenced at Mount Vernon on April 22 and was completed May 31. Monitoring was done by the college coordinators, faculty members, and project staff.

19. Analysis of Data

Analysis of data was done at intermittent periods during the pilot studies although the bulk of the data was not compiled until the conclusion of the final studies (May 31). These analyses are given in Chapter III.

20. Evaluation of Results of Pilot Studies

An on-going evaluation of the pilot study activities was made at each institution during the winter and spring months. Interviews were held with students, teachers, and librarians so as to compile anecdotal information that would be of use in the final evaluations. Evaluation of all studies took place shortly after the May 31 closure date.

21. Analysis of Phase I Bibliographies

In order to characterize the nature of graphic information being transmitted in community colleges and the formal specifications of the transmittal media, an in-depth analysis of a sample of the Phase I bibliographic entries was made. This included, for each selected entry: the type of material (book, newspaper, magazine, or other); the level of reading (required, recommended, or available); the number of pages; the availability of a subject index, author index, combined index, table of contents, footnote location (at end of reference, chapter, section, or bottom of page), bibliography, list of references, table of figures, table of illustrations, appendix; the physical dimensions of the pages; the margin size; the number of columns per page; the type size (for the text, index, quotations, and footnotes); the number of photographs; the number of drawings or other illustrations; the number of charts, tables, and graphs; the number of foldouts or other material covering more than one page; the number of color graphics; and the number of black and white graphics.

As a result, it was found that the instructional media suggests an information flow in community colleges involving (1) discursive thought and verbal concepts (represented by didactic, essay-style text) and (2) non-discursive thought and non-verbal concepts (represented by illustrative materials such as maps, charts, graphs, and tables). This analysis led to the construction of design specifications for the document collection component of the microform system. A detailed report appears in Appendix A.

22. Adjustments of Research Design for Phase III

Findings to the pilot studies as well as experience gained in the actual planning, launching, and conducting of the pilot studies and the analysis of the Phase I bibliographies led to adjustments in the research design as proposed for Phase III funding. The changes were predicated on probing the question of whether microform systems can be effective in enriching the educational development of students--not merely if microforms can be substituted for traditional hardcopy materials which already exist in the community college library. In consequence, the mission of Phase III was conceived as (1) the development of a microform system that would offer students greater scope and depth in their learning resources and (2) the evaluation of the microform system in terms of its effect on the educational development of community college students.

Specific adjustments are reflected in Chapter IV of this report.

23. Develop Sampling Plan for Phase III

To evaluate the extrapolation of research findings to community colleges throughout the nation, a sampling plan was devised that would identify certain institutions that are characteristic of various regions in the United States and other institutions representing unique characteristics of two-year college education.

On the basis of a study by American College Testing Program, Inc., entitled The Two-Year College and its Students: An Empirical Report (Iowa City, Iowa: ACT, 1969), the nation was divided into six regions (Northeast--combining the New England and Middle Atlantic regions, Southeast, Great Lakes, Plains, Northwest, and Far West). Descriptive norms were determined for each region, identifying values or ranges of values of variables that characterize the two-year colleges within each region. Criteria considered were (1) full-time enrollment, (2) type of financial support--public, private, or sectarian, (3) type of community--urban, suburban, rural, (4) type of curriculum, and (5) service to disadvantaged clientele. Colleges matching these criteria formed a "regional pool" from which two to five "finalists" in each category were chosen by the project staff and associates at AAJC on the basis of personal knowledge about or experience with the colleges. A final selection of one college in each region was delayed until on-site visitations could be made, as described in the following section of this chapter.

In addition to the six regional categories, the sampling plan also identified an "at large" pool of two-year colleges in each of the following categories: (1) innovative, (2) atypically large enrollment, (3) technical or vocational program, (4) predominantly disadvantaged clientele, (5) predominantly minority enrollment, and (6) new institution--opening for the first time in the autumn of 1971.

The reason for including these categories in the sampling was to provide a broader data base than "typical" institutions, alone, could offer. Again, as with the "regional pool," the eligible candidates in each category were narrowed to two to five colleges which would be visited before a final selection was made. The project staff again was assisted by AAJC associates in the selection of "at large" finalists.

The total number of finalists was twenty-nine, of which twelve could be selected within the confines of the proposed budget for Phase III. The list of finalists is as follows:

Brazosport Junior College, Freeport, Texas

Carl Sandburg College, Calesburg, Illinois

Cazenovia College, Cazenovia, New York

Clark County Community College, Las Vegas, Nevada

Coastal Carolina Community College, Jacksonville, North Carolina

College for Human Services, New York, New York

College of the Mainland, Texas City, Texas

Cooke County Junior College, Gainesville, Texas

Dodge City Community College, Dodge City, Kansas

DuBois Campus, Pennsylvania State University Commonwealth
DuBois, Pennsylvania

Fayetteville Technical Institute, Fayetteville, North Carolina

Greenfield Community College, Greenfield, Massachusetts

Humacao Regional College, University of Puerto Rico, Humacao,
Puerto Rico

Los Angeles City College, Los Angeles, California

Los Angeles Valley College, Van Nuys, California

Long Beach City College, Long Beach, California

Mobile State Junior College, Mobile, Alabama

Monroe County Community College, Monroe, Michigan

North Shore Community College, Beverly, Massachusetts

Orange Coast College, Costa Mesa, California

Santa Monica College, Santa Monica, California

Santa Fe Junior College, Gainesville, Florida

Shoreline Community College, Seattle, Washington

Sierra College, Rocklin, California

South Florida Junior College, Avon Park, Florida

Skyline College, San Bruno, California

State Fair Community College, Sedalia, Missouri

Westbrook College, Portland, Maine

Whatcom Community College, Ferndale, Washington

24. Selection of Colleges for Phase III

The selection of one college in each of the twelve categories will result from visits to the colleges identified by the sampling plan. The visits are being preceded by phone calls to the respective presidents explaining the nature of the project and requesting an expression of interest in possibly becoming involved in the study. Prior to visiting each college, questionnaires are being mailed to solicit additional institutional and library data; samples are appended to this report (see Appendix B).

All but three of the colleges were visited between April 22 and May 26 and involved discussions of up to three hours each with the president, the librarian, and other faculty or administrators.[19] Special attention is being devoted to the library facilities wherein the microform systems would be installed if the institution were invited to participate--and if, after learning more about the project, the college officials wanted to participate. At the conclusion of each visit, the director is informing those present that final selections will not be made until the status of Phase III funding by USOE has been determined.

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[19]The remaining three colleges will be visited before the final selection is made.

25. Preparation of Reports for USOE

Interim reports were prepared and submitted to USOE on a quarterly basis. Included in each were a description of major activities, a description of any research or administrative problems, copies of dissemination products (news releases, speeches, articles, etc.), a description of capital equipment acquisitions, a report on staff utilization, and a list of activities planned for the next quarter.

26. Preparation of Dissemination Products

From time to time, announcements regarding the project's activities were prepared for distribution to various professional journals or newsletters (e.g., the Junior College Journal, the Federal Library Committee Newsletter, and the Microfilm Newsletter); a news release concerning the selection of Phase II colleges was channelled through the AAJC Public Relations Department for distribution to various individuals and associations throughout the nation; speeches were prepared for delivery at such functions as the "Microform Utilization" conference in Denver, Colorado (December 1970), the American Library Association-American Association of Junior Colleges' joint committee meeting during the 1971 AAJC convention in Washington, D.C., and the American Educational Research Association's Special Interest Group in Junior Colleges session in New York City (February 1971); an article describing the project was published in the January 1971 issue of the Journal of Micrographics; and a tape-slide show depicting the Phase II pilot studies was prepared and was shown during the National Microfilm Association's convention in Washington, D.C. (May 1971).

27. Attendance at Professional Meetings

Professional meetings attended by the director and/or research specialist during the year included a seminar by the Advanced Management Research Institute, a seminar by the Educational Records Bureau, a conference sponsored by the Educational Testing Service, meetings of the Capitol Chapter of the National Microfilm Association, the Denver Research Institute microform seminar, a meeting of the American Educational Research Association's Special Interest Group in Junior College Research, the National Microfilm Association's Mid-Winter Meeting, the National Microfilm Association's annual convention, and the American Association of Junior Colleges' annual convention. Wherever possible, one-page descriptions of the project were circulated and informal talks with interested individuals were entered into. A display booth was designed and operated at the AAJC convention; students involved in the pilot studies, as well as members

of the project staff were available for discussion and to demonstrate a portion of the equipment and materials being used.

28. Submission of Phase III Proposal

In February 1971, a proposal was submitted to USOE for continued funding of the project. Specific ingredients of the proposal constitute a portion of Chapter IV.

29. Meetings with Advisory Committee

The Advisory Committee for the project convened twice during the 1970-71 academic year--in November and in May. Recent developments and activities were presented and advice and direction were sought. The committee members were consulted at other times during the year, either in person or by phone or letter.

CHAPTER III

Pilot Studies

The pilot studies of Phase II were of two types--experimental and demonstration. The experimental studies were made in field settings--on two-year college campuses using two-year college students as subjects and course materials from the college curriculum. The demonstration studies may be, perhaps, better described as field studies, since their purpose was to explore procedural and environmental problems relating to the dynamic use of microform collections in a two-year college.

The overall structure of the experimental pilot studies was conceived as an interlocking, overlapping group of experiments, each separately designed, executed, and analyzed, with each contributing data to an overall analysis.

The experimental studies were designed to probe three basic questions:

(1) Will students who use learning resource materials in microform accept the medium as well as students using traditional materials accept the traditional hardcopy medium?

(2) Is student acceptance of microforms differentially affected by any one or combination of the five factors posited (Mode, Access, Format, Image, Content)?

(3) Is student learning affected by using microforms?

The dependent variable, student acceptance, was operationally defined as scores on an attitude inventory, described later in this chapter.

The dependent variable, student learning, was operationally defined as self-reported grade in the course.

The demonstration or field studies sought to develop procedures for evaluating equipment and microform collections and to delineate problems related to the active use of microforms in a library setting and in a campus-extension setting.

A. Instruments

The measuring of students' attitudes toward microforms required the development of an attitude inventory instrument. Besides the underlying concern with instrument reliability, there were three general concerns which governed the development of such an instrument:

(1) an interval or, at least, an ordinal scaling of respondents would be desirable in order to utilize statistical tests with sufficient power to answer the questions being probed;

(2) a measure of attitudes about school, teachers, library facilities, etc., would be desirable to test the hypothesis of a "halo effect";

(3) items must be relevant to hardcopy as well as to microforms, so that direct comparisons of experimental and control groups could be made.

The form of the response to the items in the attitude inventory which was developed was that of agreement or disagreement. In general, the observations scaled are of the type "affective-subject"[20] which implies a scaling and differentiation of subjects according to their responses, as opposed to the scaling of the stimulus-objects in terms of subject-response.

A pool of items was created in the form of statements about school, course, teacher, library, and materials. For each statement an opposing statement was devised. For example, "I like to read" was opposed by "I do not like to read." Two instruments were then delineated, each containing either a positive or negative form of the pool of items. Each instrument, in itself, was equally divided between positive statements and negative statements. Form A and Form B are reproduced in Appendix C.

The purpose in developing parallel forms of the Attitude Inventory was two-fold: response-reliability could be easily established for each item, and parallel forms would permit repeated measures with lessened possibility of reactive effects.

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[20]"Attitude Measurement," Upshaw, Harry S. in Methodology in Social Research, Blalock, Hubert M. Jr. and Blalock, Ann B., editors. New York: McGraw-Hill Book Company, 1968, p. 69ff.

To establish item-reliability and discriminability, as well as to establish non-experimental norms for each item, a population of 436 students from four community colleges located in the Los Angeles area was used. Each student was asked to respond to all items in Form A and Form B. So that they could not force self-agreement by checking their first response to an item, the first form was collected before the second was distributed. All forms were numbered so that responses could later be collated and compared. The item-to-item correlation coefficients between Form A and Form B is given in Table 2.

In interpreting the statistics given in Table 2, two important considerations should be noted. First, because the forms of the statement (except item 6) were opposite (positive vs. negative) in the two forms, all correlation coefficients (except for item 6) should be negative. Second, not all statements were as obviously "mirror" statements as "I like to read" and "I do not like to read."

Although virtually all correlation coefficients in Table 2 are statistically significant, they are, on the whole, strikingly low. In some instances, no doubt, the low correlation may be attributed to a lack of actual correspondence between presumed positive and negative forms of the same statement. Unquestionably, the correspondence is not perfect between the two statements "The teacher did not seem very interested in most of the required reading," and "It was difficult to keep up with the discussion in class without having done the reading assignment" (item 16). However, on the face of it, it would appear to have a higher degree of association than the computed correlation coefficient of -.0261.

A more generally persuasive accounting for the low correlation coefficients is that student attitudes about the things evaluated in the instrument are, themselves, equivocal. How else can the correlation coefficient of -.6445 for item 12 (I like to read-I do not like to read) be explained? Or the -.5648 for item 17 (I liked the teacher-I did not like the teacher)?

Because of this equivocal attitude regarding school and learning resources it is, perhaps, surprising that the general attitude scale (very unfavorable to very favorable) proved to be quite reliable, with a correlation coefficient of .8714.

The question of item discriminability was not considered as critical as that of reliability. Although some degree of discrimination among students was necessary in order to scale them in terms of positive attitude, each item in the attitude inventory was also considered as yielding specific information in terms of responses to the item per se. In effect, each item was considered as a criterion-referenced item, serving as an "affective-object" type of observation. For example, the item "I like to read" was considered informative in terms of the number of subjects in a group who responded

TABLE 2

ITEM RELIABILITY AND DISCRIMINABILITY
ATTITUDE INVENTORY

Item	Correlation Coefficient (Reliability)	Proportion Agreeing with Statement
1	-.4643	.1766
2	-.3419	.1651
3	-.3541	.8028
4	-.2670	.1193
5	-.2371	.8119
6	+.6153	.6422
7	-.3488	.0688
8	-.1896	.7569
9	-.2667	.2064
10	-.4564	.8372
11	-.5177	.1078
12	-.6445	.2156
13	-.4858	.8050
14	-.3813	.8920
15	+.2522	.8005
16	-.0261	.8096
17	-.5648	.1651
18	-.2544	.7500

positively or negatively. In short, the items were considered important not only in terms of scaling or differentiating groups by their responses to the items (affective-subject) but also in terms of scaling items by the percentage of positive and negative responses from groups. The analysis of data reported subsequently for Pilot Study I will illustrate this concept explicitly.

The proportion of positive and negative responses to items serves not only to indicate discriminability (.50/.50 being optimum) but to establish levels of acceptance of learning resources among a population of students who responded in terms of traditional material. Table 2 gives the proportion of agreement with each statement, using the items from Form A.

Because agreeing with some statements actually indicates a negative attitude, all scores were converted to indicate only positive attitudes. Thus, proportions in Table 3, below, indicate positive attitude--not positive response to the items.

As implied above, the Attitude Inventory was not designed to exhibit functional unity over the entire instrument. Instead, three major areas of student attitude--learning resources, facilities, and school/course/teacher--were questioned. Even within each of these areas of interest, the individual items were created to reflect attitudes about specific points: library procedures, ease of accessibility, physical condition of learning resource material, relevance of assigned reading to the course, etc. In view of this approach to developing the Attitude Inventory, the low inter-correlation among items shown in Table 4, below, is not surprising.

Additional questions on Form A inquire about the respondent: age, sex, grade in course, etc. (see Appendix C). The purpose served by these questions was to determine the degree of association among these factors and attitudes. The correlation coefficients for the "norm" group indicate no meaningful relationship among any of these variables, nor between any of them and student attitudes.

In summary, the Attitude Inventory Form A was used to scale both respondent groups and specific items. In the analysis of data gathered in the experimental pilot studies, the summary self-rating of attitudes which appears as the final item of Form A was used as an interval measure of discrimination among students with regard to their attitudes about specific learning resources. Additional analyses were made of responses to individual items.

TABLE 3

POSITIVE ATTITUDE SCORES
(NORM GROUP, N = 436)

Item	Proportions
1	.8234
2	.8349
3	.8028
4	.8807
5	.8119
6	.6422
7	.9312
8	.7569
9	.7936
10	.8372
11	.8922
12	.7844
13	.8050
14	.8920
15	.8005
16	.8096
17	.8349
18	.7500

TABLE 4

INTER-CORRELATION OF ITEMS
ATTITUDE INVENTORY, FORM A
(NORM GROUP, N = 436)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.000	.0694	-.0727	.3306	-.0080	-.0307	.0404	-.1722	.3136	.0251	.0718	-.0380	.0154	-.0132	-.0547	-.0972	.0532	-.0799
2		1.000	.1211	.0269	.0560	.0742	.1963	-.0791	.1395	-.0213	.0247	-.0079	.0318	.0335	-.0716	-.0518	.1017	-.0428
3			1.000	-.1733	-.1302	.1350	-.0247	.1356	-.1887	.0468	-.0126	-.0345	.0471	.0713	.1419	.1854	-.0590	.0732
4				1.000	.0503	.0089	.1516	-.1709	.1620	.0281	.0546	-.0208	.0561	.0141	-.0465	-.0379	.0079	.0000
5					1.000	.2162	.0613	.1788	-.1605	.0421	.0159	-.0902	.0891	.1163	.0975	.0357	-.0073	.0610
6						1.000	.0139	.2239	-.1631	-.0984	-.0845	-.1205	.1399	.0022	.1062	.0768	-.0160	.0553
7							1.000	-.0994	.1300	-.0274	.0516	-.0103	-.0492	-.0222	-.0230	.0164	.0499	.0105
8								1.000	-.2394	.0252	-.0616	-.0669	.0720	.0113	.1184	.0929	-.0071	.0432
9									1.000	-.0360	.0603	.1047	-.0637	.0113	-.0289	-.0991	.0632	-.0851
10										1.000	.0532	-.0860	.3161	.0667	.1995	.2608	-.2723	.0323
11											1.000	-.0024	-.0530	-.0220	.0255	-.0010	.0247	-.0355
12												1.000	-.1080	-.1798	-.1011	.0411	.0222	-.1739
13													1.000	.2049	.2613	.0563	-.1398	.1170
14														1.000	.1592	.1163	-.1040	.0309
15															1.000	.2111	-.1489	.0696
16																1.000	-.1934	.0978
17																	1.000	-.0428
18																		1.000

B. Experimental Pilot Studies

1. Experimental Pilot Study I

As one of the three interlocking experimental studies designed to assess the effects of the five factors--Mode, Access, Content, Format, and Image--Pilot Study I was designed to test the following hypotheses:

Hypothesis I. Acceptance of microforms will differ significantly between groups of students using Mode III (one reference per microfiche unit) and those using Mode IV (several references per microfiche unit).

Hypothesis II. Acceptance of microforms will differ significantly between students whose utilization is restricted to the learning resource center and those who are allowed to use microforms at home, as well as in the learning resource center.

Hypothesis III. Students will show no preference with regard to image polarity.

The design of the experiment is illustrated in Figure 1.

FIGURE 1

EXPERIMENTAL PILOT STUDY I

A = Mode: a_1 = Mode III, a_2 = Mode IV

B = Access: b_1 = free, b_2 = restricted

S = Subject Group

	b_1	b_2
a_1	s_1	s_2
a_2	s_3	s_4

Twenty students who enrolled in a survey of American history class at Northern Virginia Community College were assigned randomly to four experimental groups.

Each student in Group 1 was provided with a reader and ten microfiche, each containing a single reading assignment. Microform utilization for this group was possible at home or in the learning resource center. In Group 2, each student also was provided with a reader to use at home and one microfiche containing all ten reading assignments. Group 3 restricted each student to the use of microforms in the learning center only, with each of the ten reading assignments on a separate microfiche. Each student in Group 4 was assigned to use microform in the learning center only, with all ten reading assignments on a single microfiche.

For each group, the reading assignments were identical and totaled 195 pages. In order to minimize the possible differential effect of different readers, the same make and model readers were used for all groups (Seaco, Micra 210). For Groups 1 and 2 the text material was filmed and read at 18x1. For Groups 3 and 4 a reduction ratio of 32x1 was required in order to accommodate the entire ten reading selections. Only the optical and illumination system differed between the readers used by the various groups. In all other respects, the readers were identical.

The text material, consisting entirely of essays, was issued initially to all groups in positive image polarity. At mid-quarter all groups were issued the entire collection in negative image.

At the conclusion of the quarter, eighteen students completed the Attitude Inventory (two students having dropped the course during the first week). In addition, they were requested to specify a preference for positive or negative image and to relate any criticisms or comments they might have regarding the equipment.

The initial analysis of the data utilized the score for each student taken from his response to the final item of the Attitude Inventory, in which the student was required to assess his attitude toward the learning resources used in the course, on a scale of 1-5, very unfavorable to very favorable. The results are summarized in Table 5.

From the summary presented in Table 5 it is apparent that the data do not support either Hypothesis I or Hypothesis II. The F ratios calculated for the effects of microform mode or access failed to reject the null hypothesis in either case.

TABLE 5

ATTITUDE SCALE, STUDY I

Source of Variance	Sum of Squares	df	Mean Square	F
A	.3003	1	.3003	.2649
B	1.2441	1	1.2441	1.0975
AB (interaction)	.4719	1	.4719	.4163
within cell	15.87	14	1.1336	

N = 18

Analysis of responses to individual items on the Attitude Inventory for the most part also failed to reject the null hypothesis. Three exceptions should be noted, however. Between the groups who used microforms in the learning resource center only, significantly different responses to items 2, 5, and 11 were noted (Table 6).

TABLE 6

DIFFERENTIATING ITEMS, STUDY I
(ATTITUDE INVENTORY, FORM A)

Item Number	Statement	Chi Square
2	"The environmental conditions (room, chair, lighting, etc.) under which I read the material were comfortable."	7.900*
5	"The whole process of acquisition of the material, reading, and note-taking was too much trouble."	5.819**
11	"Getting to the library is no trouble."	5.819

Fisher's Exact Probability (two-tailed test): * = .0037, ** = .0131

N = 18

Experimental hypothesis III (Students will show no preference with regard to image polarity) was sustained. Seven students indicated no preference, seven preferred a negative image, and four preferred a positive image. Preference was apparently associated with mode, however. Of eight students using Mode III, six preferred a negative image, two indicated no preference and none preferred positive. The opposite tendency was noted for students using Mode IV, with four choosing negative, five indicating no preference, and only one preferring positive. Lambda (Guttman's coefficient of predictability) computed for these frequencies is .3636.

2. Experimental Pilot Study II

The second experimental study was designed to assess the effects of Format, Microform Modes II and III, and possible interaction effects. Specifically, the following hypotheses were tested:

Hypothesis I: Acceptance of microforms will differ significantly between groups of students using Mode II (several microfiche per reference) and those using Mode III (one reference per microfiche unit).

Hypothesis II: Acceptance of microforms will differ significantly between groups of students using microforms in vertical format (cine) and those using microforms in horizontal format (comic strip).

The design of the experiment is illustrated in Figure 2.

FIGURE 2

EXPERIMENTAL PILOT STUDY II

A = Mode: a_1 = Mode II, a_2 = Mode III

B = Format: b_1 = horizontal, b_2 = vertical

S = Subject group

	b_1	b_2
a_1	s_1	s_2
a_2	s_3	s_4

Eight students enrolled in two courses at Washington Technical Institute, "Chemistry for Nurses" and "Anatomy," were recruited and paid a stipend for their participation in the experiment. Two students were assigned to each treatment condition:

(1) Mode II, horizontal format

(2) Mode II, vertical format

(3) Mode III, horizontal format

(4) Mode III, vertical format

All students were provided with readers to use at home and additional readers were made available for their use at the campus learning center. Students using Mode II were issued DASA FMR/50 readers; students using Mode III were provided with NCR PCMI readers. The textbooks for each of the courses (chemistry and anatomy) were filmed at two reduction ratios--150x1 and 20x1--and formatted both horizontally and vertically.

At the conclusion of the quarter, seven students (one had withdrawn from school) were asked to complete twelve items from the Attitude Inventory, Form A and a questionnaire relating to mechanical operation of the equipment. The items deleted from Form A (1-5, 11) relate to the learning resource center procedures, which had no relevance to this experiment.

The self-rating of attitude toward learning resources (final item, Form A) was tabulated by group for each student (Table 7).

TABLE 7

ATTITUDE SCALE SCORES, BY TREATMENT GROUP, STUDY II

S_1	S_2	S_3	S_4
4	5	3	4
	4	5	4
$\bar{X} = 4$	$\bar{X} = 4.5$	$\bar{X} = 4$	$\bar{X} = 4$

It is evident by inspection that no significant differences exist among the four treatment conditions, nor is there any indication of interaction effects.

Comparison of the frequency of positive responses of the various combinations of treatment groups to individual items of the Attitude Inventory also fail to reject the null hypotheses. Frequencies of positive attitude responses are given in Table 8.

3. Experimental Pilot Study III

To assess differences in students' attitudes as they might relate to the use of Mode I (roll microfilm) or Mode II (several microfiche per reference) and to different types of subject matter (essay or display), Pilot Study III was designed. The specific hypotheses tested were:

Hypothesis I: Students will indicate a more favorable attitude toward either Microform Mode I or Mode II.

Hypothesis II: Student attitudes will differ between microform reproductions of essay-type subject matter and display-type subject matter.

Hypothesis III: Student attitudes about learning resources will not vary significantly between groups of students using microforms and those using traditional hardcopy materials.

A fourth hypothesis was also tested in which student learning was the dependent variable.

Hypothesis IV: Students who use microforms will learn as well as students who use traditional hardcopy materials.

The design of Study III required the use of repeated measures, as shown in Figure 3.

Eight students at Montgomery College who were enrolled in either "Child Psychology" or "Geology" were recruited to participate in this study. All textbooks for both courses were filmed for reel-type microfilm readers and for 20x1 microfiche. All copies were positive images, horizontal format. Initially, all students were provided with microfilm readers to use at home (Xerox 1212). Four students enrolled in "Child Psychology" were issued microfilm copies of the text; four students enrolled in "Geology" were issued microfilm copies of the text plus copies of a supplemental text used in the course.

TABLE 8

RESPONSE FREQUENCIES BY TREATMENT, STUDY II

ITEM NO.	Mode II		Mode III		Horizontal		Vertical	
	Positive Attitude	Negative Attitude	Positive Attitude	Negative Attitude	Positive Attitude	Negative Attitude	Positive Attitude	Negative Attitude
6	1	2	1	3	2	1	1	3
7	3	0	4	0	3	0	4	0
8	2	1	3	1	2	1	3	1
9	2	1	2	1	1	2	3	1
10	3	0	2	2	2	1	3	1
12	3	0	3	1	3	0	3	1
13	1	2	3	1	2	1	2	2
14	3	0	4	0	3	0	4	0
15	3	0	4	0	3	0	4	0
16	3	0	4	0	3	0	4	0
17	3	0	4	0	3	0	4	0
18	2	1	2	2	2	1	2	2

FIGURE 3

EXPERIMENTAL PILOT STUDY III

A = Subject Matter Content: b_1 = essay, b_2 = display

B = Mode: a_1 = Mode I, a_2 = Mode II

	b_1	b_2
a_1	s_1	s_1
a_2	s_2	s_2

At mid-semester each student responded to the Attitude Inventory, Form A, in terms of his or her experience with microfilm in either "Child Psychology" or "Geology." Also at mid-semester, all students returned their readers and film and were issued the same material on microfiche. Microfiche readers (Seaco, Micra 210) were also issued to each student to use at home.

At the end of the semester, all students using microforms were asked to respond to the Attitude Inventory, Form A, in terms of their experiences with microfiche. At the same time, 45 students who had used hardcopy materials for the same courses also responded to the Attitude Inventory, Form A.

Although the experiment design indicated in Figure 3 called for repeated measures of all subjects, three of the original group of eight subjects were not present at the time of the second administration of the Attitude Inventory. Unfortunately, subsequent efforts to acquire completed Inventory forms from these students have been unsuccessful.

Further complications arose when it was discovered that all students in the experimental group were actually enrolled in both "Child Psychology" and "Geology" and were using microform materials for both classes. Furthermore, when questioned, they felt unable to differentiate their attitudes toward each of the two classes.

In view of the de facto modifications of the research design, two analyses of the data were made. To test Hypothesis I, a t test of differences between two correlated means was made, utilizing the individual scores on the general attitude scale from the Attitude Inventory, Form A. Because only five students responded to both administrations of the instrument, only those five pairs of scores could be used for the analysis shown in Table 9.

TABLE 9

ATTITUDE SCALE SCORES, STUDY III

Mode I (microfilm)	4.0
Mode II (microfiche)	3.4
$\underline{t}$ = .88465	df = 4
($p < .05$, $\underline{t}$ = 2.776)	
N = 5	

Because of the professed inability of the students to differentiate their attitudes about microforms in each of the two courses, no test of Hypothesis II was made.

Hypothesis III was tested by comparing the mean general attitude score of the experimental group, who had used microforms, with that of the 45 students in the control group who had used traditional materials.

Although $\underline{t}$ is affected by large discrepancies in $\underline{n}$'s (such as that found between these two groups) the small difference between the two means (experimental group mean = 4.0, control group mean = 3.911) yields an unquestionably non-significant $\underline{t}$ value. Thus, Hypothesis III was supported by the data.

Hypothesis IV was tested by comparing the means of self-reported grades in the course for the experimental group and the control group. The computed $\underline{t}$ for this difference (experimental group mean = 3.0, control group mean = 2.76) was .8141. Significance at the .05 level (two-tailed) requires a $\underline{t}$ value of 2.008. Hypothesis IV was supported.

C. Analysis of Pooled Data From Experimental Studies

To achieve some sense of overall findings the data from the three experimental pilot studies were pooled to test the following hypothesis:

Hypothesis: Attitude toward learning resource materials of students using microforms will not vary significantly from those of students using traditional materials.

1. Experimental vs. Control

A t test was made of the difference between the means of the entire experimental group and the control group on the attitude scale (5 point scale at conclusion of Attitude Inventory, Form A). The mean of the experimental group was 3.636. For the control group, the mean was 3.911. The computed t for this difference is 1.358, which is not large enough for significance at the .05 level.

A further test of the hypothesis was made in terms of the degree of association between the five treatment groups (four experimental groups plus one control group), as nominal classes and their attitude ranked. For this test, θ was calculated as .1528[21]. This is interpreted in terms of predictability of attitude score by knowledge of group. In the present case, such knowledge would predict accurately approximately 15% of the cases.

Both tests support the hypothesis that students who have been using microforms do not have significantly different attitudes toward them as learning media than students who have been using traditional materials have toward those materials.

A third analysis of the pooled data compared the positive-attitude responses of the total experimental group with those of the control group to each item on the Attitude Inventory, Form A. Chi square was computed for each set of response frequencies and significant differences were found for two items:

Item 6: "Not being able to mark on the materials (writing in the margin, underlining) made studying and note-taking more trouble." Chi square = 10.521 ($p < .01$).

Item 9: "I would like to continue using the same kind of learning resources." Chi square = 7.297 ($p < .01$).

2. Experimental vs. Norm

An analysis of the responses of individual items in the Attitude Inventory, Form A comparing the experimental group with the norm group in the main also confirmed the hypothesis of no difference between microform users and hardcopy users. However, there were several items on which significant differences were noted. Of a total of 18 items, the experimental group's responses differed from the norm on seven. Two of those items relate to the library or learning resource center, four relate to the materials, and one concerns the relevance

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[21] Elementary Applied Statistics, Freeman, Linton C. (New York: John Wiley and Sons, Inc. 1965), p. 108ff.

of the required reading. Table 10 indicates the proportion of each group responding with positive attitude and the computed chi square for such proportions for each item where the difference was significant.

A comparison of the experimental group mean attitude scale rating (3.6360) with that of the norm group (3.0989) indicates a significant difference ($z = 2.99$, $p < .01$), with microform users scoring a more positive attitude than the norm group.

TABLE 10

FREQUENCY OF RESPONSES INDICATING POSITIVE ATTITUDE
EXPERIMENTAL AND NORM GROUPS

Item	Proportion of Positive Attitude Responses (in percent) Experimental	Norm	Chi Square
2. The environmental conditions (room, chair, lighting, etc.) under which I read the material were comfortable.	62	83	10.031*
6. Not being able to mark on the material (writing in the margin, underlining) made studying and note-taking more trouble.	36	64	14.580*
7. The physical condition of the reading material was always good.	61	93	27.132*
8. I would have done more reading if it had been less trouble.	49	76	14.421*
9. I would like to continue using the same kind of learning resources.	46	79	21.845*
11. Getting to the library is no problem.	77	89	4.288**
15. Much of the reading was trivial and a waste of time.	91	80	4.033**

df = 1 * $p < .01$, ** $p < .05$

D. Summary and Interpretation of Experimental Studies

Three broad research questions were probed by the experimental pilot studies:

(1) Will students who use learning resource material in microform accept the medium as well as students using traditional material in microform accept the medium as well as students using traditional materials accept the traditional hardcopy medium?

(2) Is student acceptance of microforms differentially affected by any one or combination of the five factors posited (Mode, Access, Format, Image, Content)?

(3) Is student learning affected by using microforms?

Because random sampling procedures were impossible, no final or broad generalizations could be anticipated from the results of the experiments. Instead, the position of the researchers was conceived as seeking "pointers" or indications upon which a broader research effort might be planned. In effect, then, certain procedures (such as pooling data) which might in other circumstances be unacceptable, are in this context quite appropriate.

The first broad research question was answered positively. Pooling the data from all experiments indicated that when scores on the general attitude scale ("I would classify my attitude toward the learning resources for this class as: very favorable, favorable, neutral, unfavorable, very unfavorable.") were compared for the experimental group and the control group, no significant difference was found. But when the means of the experimental group and the norm group were compared, the mean for the microform users was significantly higher than the mean for the norm group of hardcopy users.

The differences of proportion of responses indicating a positive attitude on each of the items of the Attitude Inventory, Form A, are not so easily interpreted. In all instances but one, the norm group was more favorable than the experimental group (see Table 10) when there was a significant difference between the responses of the two groups. This may very well be a function of the proportion of total learning resource materials for which the students in the two groups required library services. For example, if students in the norm group actually were using almost exclusively their own textbooks, with very little supplementary reading required, their responses to items 2, 6, 7, 8, and 11 would be predictably favorable, since they were in control of the critical factors.

At first glance, the more favorable attitude of the norm group indicated by their responses to item 9 (I would like to continu-

using the same kind of learning resources) would seem of more serious concern. However, it should be noted that while the microform users could compare that medium with hardcopy, relatively few, if any, of the norm group could be expected to imagine what kind of learning resources other than hardcopy might be possible.

In view of the fact that 91% of the experimental students found their required reading "trivial and a waste of time" (item 15) it is surprising that such disdain did not appear to be reflected in their attitudes toward the medium of microform.

The second question, regarding the differential effect of posited factors on student acceptance of microform, was also answered clearly by the experimental studies. The only significant difference found was with regard to accessibility. There seems to be little question that students prefer studying at home. Of interest in this regard is the fact that even among students constrained to use microforms in the learning resource center only, attitudes toward microform as an instructional medium were relatively unaffected.

The question of student learning, as operationally defined, was answered negatively--using microforms does not appear to affect student learning.

The overall conclusion, based on the findings of the experimental studies, is that students using microforms at the level of utilization required in the pilot studies seem willing to accept microforms as a learning tool. Furthermore, it is concluded that acceptance seems to be relatively independent of the factors posited as being of critical concern. Learning evidently is unaffected.

E. Demonstration Pilot Studies

In addition to the experimental pilot studies reported above, two demonstration or field studies also were undertaken. The first study was designed to explore the problems which may face libraries with dynamic microform collections. The second explored the problems of the "portable" library.

1. Demonstration Pilot Study I

The pilot field study in the library at Mount Vernon College involved the use of four microfilm (reel) readers, five microfiche readers, one microprint reader, one ultrafiche reader, one automated retrieval and microfiche reader unit, and a microfiche duplicator and printer. Student use of the readers was measured by timing

devices (on loan to the project from the Denver Research Institute) which recorded the number of times the reader was turned on and the cumulative amount of time the reader was used. A list of the equipment used is given in Appendix D.

In addition, fifteen microform collections were made available by seven micropublishers for student and faculty use. A complete bibliography of these collections is given in Appendix E.

Procedurally, the collection was made available to all persons who used the Mount Vernon College library between January and June, 1971. Faculty and student orientation programs were conducted by the library staff (with assistance by the project staff). Instruction sheets and posters were placed at strategic locations in the library to remind persons about the collection and its use, and to inform other persons who were not reached through the regular orientation sessions.

An external, hardcopy listing of the microform entries was provided by the library staff and was located immediately adjacent to the collection. In view of the short-term loan of equipment and material to the college, no attempt was made to cross-reference the collection entries with the regular listings in the card catalog, although the value of such an effort in a "permanent" situation is evident.

Materials could be checked out for library use by anyone desiring to do so; readers were available throughout the library for local use. Portable equipment was available for 24-hour or weekend checkout purposes, thus providing for dormitory or off-campus reading. Film duplication equipment enabled the library staff to print copies of selected materials on demand for check-out purposes, thus assuring complete collection integrity in the library at all times. In other words, regardless of the demand for a given reference--either for use in the library or outside the library--a copy always was available in the library. Original microforms as well as duplicate copies were returned to the library staff for refiling. All duplicate microforms were accounted for and were disposed of whenever the portable reading equipment was returned to the library.

At faculty meetings and via memoranda, the library staff encouraged the incorporation of microform materials into the respective reading lists and assignments. By mid-spring, there was evidence that substantial faculty support in this regard had been given.

Routine maintenance of equipment and materials was conducted by the library staff. Microform company servicemen were available for major repairs or replacements, but were not required during the experiment.

The environment of the library was altered only to a moderate extent. Equipment was placed on tables or other work areas throughout the library, with the collection placed on open shelves in the reading room. In order to gain access to electrical outlets, minor rearrangement of furniture was necessitated, but no permanent structures or fixtures were affected. Neither natural nor artificial lighting was altered in the main reading room; two rooms were available elsewhere in the library for subdued lighting if preferred by the users.

Because all the equipment used in the Mount Vernon Library Study was loaned to the project by manufacturers, equipment was installed on various dates, ranging from January 1 to February 22. Table 11 indicates the date of installation of each reader, as well as the measures given by the timing devices at an approximate mid-point and at the end of the study. Note that not enough timers were available to equip each reader, therefore, use of some readers is not reported in Table 11.

TABLE 11

EQUIPMENT UTILIZATION, MOUNT VERNON LIBRARY STUDY

	Reader	Installation Date	Use (March 12) Count	Use (March 12) Hours	Use (June 2) Count	Use (June 2) Hours
Fiche:	1	1/1/71	8	3.0	Timer failed	
	2	2/8/71	20	3.0	52	12.7
	3	1/1/71	16	1.0	Timer failed	
	4*	2/22/71	46	23.0	144	57.8
	5**	2/8/71	11	3.0	33	5.6
Film:	6	2/8/71	2	1.0	Timer failed	
	7	1/1/71	54	19.0	129	37.4
		TOTALS	157	53.0	358	113.5

*Automated Retrieval Unit

**Ultrafiche

During the first part of the semester, the average amount of time per use of the readers was approximately 21 minutes. Over the second part of the semester, this average was reduced to 18 minutes. Over the whole semester, with no adjustment for varying installation dates, the average use was approximately 19 minutes.

Anecdotal information collected by the library staff led to the following observations:

1. Faculty assignments directed to microforms were limited, leaving initiation of use directly to students and library staff.

2. Indexing was adequate.

3. The diversity of readers was excellent, providing the opportunity for variety and individual preference in use.

4. No serious mechanical failures in equipment was experienced.

5. There was a distinct preference for using microfiche over microfilm reels.

6. There was a preference for up-to-date materials dealing with contemporary issues.

On the basis of the six-month library demonstration at Mount Vernon, the librarian recommended the following changes in the microform system if it were to be installed for permanent use at an institution such as his:

1. The orientation of faculty and students to microform usage is essential and should be repeated throughout the year.

2. The faculty should be supplied with a complete annotated bibliography of the microform materials available so as to enhance direct reading assignments.

3. The purchase of microform materials should stress current or recent publications rather than historical documents. The collection should concentrate on one or two subject areas relevant to the college's curriculum, rather than consist of few materials thinly scattered over a variety of subjects (assuming that a total microform collection is not instantly feasible).

4. Emphasis should be given to the procurement of portable reading equipment so as to encourage off-campus as well as on-campus reading.

2. Demonstration Pilot Study II

A second demonstration study was conducted in Oxford, England with students from Mount Vernon College who were enrolled in an overseas Shakespeare course. Although library facilities certainly are available in Oxford, the timing of the course coincided with examination time at Oxford, thus severely limiting the access to the Oxford library holdings.

For this study, ten reference books were filmed on 8mm. film for use in motirized cassette microfilm readers. Each student was provided with a reader and four cassettes, containing all the reference material necessary for the course. The readers themselves were manufactured especially for this project, being adapted for the British electrical system, and were loaned by the manufacturer.

The requirements for the course included two research papers, using material drawn from the "reference library" which each of the ten students had brought to England. At the conclusion of the course, each student responded to a questionnaire regarding the operation of the equipment and the student's evaluation of microforms as a learning medium. A specimen copy of the questionnaire is given in Appendix F.

A tabulation of student responses to the questionnaire indicates the following:

1. Every student experienced <u>some</u> mechanical difficulty, such as lamp burning out.

2. Only one student of the ten reporting felt that studying required less time as a result of using the reader. Three felt there was little difference and six thought more time was necessary.

3. All students but one felt they had become accustomed to using the readers.

4. Every student agreed that having the material available had made their overseas learning experience richer than it would otherwise have been.

5. Only one student indicated a preference for using the local library facilities available.

6. Only one student indicated an unwillingness to utilize more extensive learning resources if those resources were made available in microform.

7. Of the ten students responding, seven described their reactions to microforms as favorable; one was neutral; one unfavorable, and one very unfavorable.

The teacher's reaction to the project was distinctly favorable, since she realized more fully than her students the consequences of relying on local resources or of not having any library support for the course. She expressed the feeling that the microform collection had made it possible to demand the same quality of academic work from her students that she would have expected if the course were held in the usual campus setting.

F. Summary and Interpretation of Demonstration Pilot Studies

The Mount Vernon College library demonstration pilot study was designed to explore procedural and environmental problems in the introduction and use of substantial quantities of microform equipment and materials. With a variety of hardware and a substantial microform collection, the microform resources of the college were extensive. The short span of time (six months or less) did not permit full development of the potentials offered by the microform system (all of which was on loan to the project from various manufacturers, publishers, or suppliers), but use was active and constant throughout the demonstration period.

Generally it was concluded that students and faculty will utilize library resources in microform, but that such utilization is proportionate to the amount of assigned readings made by the faculty and to the availability of convenient and easy-to-use indexes to the microform collection. Resistence to the equipment and material was minimal.

The Mount Vernon College Shakespeare course at Oxford, England, was designed to assess student and teacher reactions to the use of an "exportable" library directly related to their course work. Utilizing portable equipment containing ten reference works on 8mm. film, the class read extensively. The enthusiasm for and endorsement of the portable microform system offset the infrequent difficulties encountered with the physical operation of the hardware. It was the concensus of the participants that the portable system enhanced their learning experiences.

CHAPTER IV

Summary and Recommendations

A. Summary

The activities of Phase II were directed toward two goals: (1) preparation for a major nationwide research effort, and (2) the collection of data relevant to student acceptability and learning effectiveness of microform collections in community junior colleges. In the main, Phase II activities focused on the formulation, execution, analysis, and interpretation of five pilot studies.

Besides developing procedures and instruments, the pilot studies evaluated microform equipment, explored problems related to the active use of microforms, and tested the effects of variables thought to be potentially critical to student acceptance and learning. Data collection was aimed at probing three general research questions.

1. Will students who use learning resource material in microform accept the medium as well as students using traditional materials accept the traditional hardcopy medium?

2. Is student acceptance of microforms differentially affected by any one or combination of the five factors posited?

3. Is student learning affected by using microforms?

After the critical elements were operationally defined (as described in Chapter III) pilot studies were designed to collect data relating to the issues raised. The data were analyzed, in general, according to fixed effects models, since a random sampling of treatments or subjects was not practical. Although the lack of random samplings makes interpretation of the data technically non-generalizable, the purpose of the pilot studies--to explore possible critical factors--was served.

The question of student acceptability of microforms was answered with convincing clarity, despite the limitations of the data. Students evidenced little resistance to microforms--either roll film or microfiche--and, in fact, were largely favorable in their acceptance. Of a total of 43 students who used microforms according to the various conditions of the pilot studies, only eight indicated an unfavorable reaction.

Although some evidence exists (from other studies) which suggests that microform acceptance may be differentially affected by the five factors of operational mode, sequence format of images, polarity of images, subject matter content, and accessibility, the data gathered

in the pilot studies do not support the general hypothesis. This finding points up strongly the value of experimentation in a field setting, since the levels of microform utilization required by the pilot studies represented a fairly wide but typical range of student study patterns. Quite possibly either a more casual contact with microforms or a very intensive use might yield selective differentiation of acceptance. But the frame for the entire project is the community college and the questions must be answered within that context.

The question of learning effectiveness of microforms, which had been answered by Kottenstette[22] in laboratory experiments, was again answered positively. The confirmation of Kottenstette's findings in a field setting suggests that further research in this area should be related to the design of specific instructional materials rather than to the medium of microform.

B. Recommendations

The major purpose of the pilot studies of Phase II was to develop guidelines and make specific recommendations for the larger research effort of Phase III. The following recommendations, it is believed, are easily operationalized into specific research plans:

(1) Research should explore the unique information-handling characteristics of microforms in the design of specific instructional materials.

(2) Guidelines for establishing ratios of readers-to-users should be developed for active microform collections, as well as for archival collections.

(3) Capabilities of microforms as a means of disseminating information should be explored more extensively.

(4) The general plan for Phase III research should involve replicated studies in order to make findings more generalizable.

The research for Phase III will be designed to probe two main research questions:

(1) In making more extensive learning resources available to students, will microform collections enhance educational development?

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[22]Kottenstette, op. cit.

(2) Can the learning resource center effectively utilize microforms as a means of disseminating (as opposed to circulating) learning materials?

Two dependent variables are indicated: student educational development, and microform utilization.

The first dependent variable may be operationally defined as student scores on standardized tests related to the area(s) of the microform collection(s). The second dependent variable may be operationally defined as a comparison of the ratios of size of collection to off-campus use of microforms and hardcopy materials, as determined by library records.

Independent variables will include integration of the microform collection into the college programs, extent of library holdings in hardcopy, number of microform readers available, and design of the microform collection.

Because of the great difficulty of executing experimental controls in a field setting, none of the independent variables will be manipulated. However, differential effects of the independent variables can be assessed post hoc, if replications are made in several colleges.

The research plan for Phase III is: (1) to develop, in cooperation with microform and curriculum experts, an extensive microform collection, taking advantage of the unique information-handling techniques of microforms; (2) to install the microform collection, together with appropriate microform reading equipment, in the college learning resource center; (3) to conduct orientation sessions with students and faculty to acquaint them with the use of the equipment as well as the contents of the collection; (4) to monitor and measure the utilization of microforms in the learning resource center and off-campus; (5) to measure educational achievement of students in the experimental college and a parallel control (where only hardcopy collections exist); (6) to replicate the design in several colleges simultaneously; and (7) to analyze data relevant to the research questions posed.

Appendix A

Analysis of Phase I Bibliographies

Introduction and Background

Many bibliographies, booklists, recommended collections, etc., have been compiled and published concerning the community college. Even a cursory glance at these or at the card catalogue of a community college library will indicate the broad and extensive areas of information with which the community college deals. The span of information included in community college instruction is exemplified in the bibliography for courses compiled during Phase I of the Microform Project: Art Appreciation, Black Studies, Economics, English, Life Science, Mathematics, Nursing, Political Science, Psychology, and Spanish.

The range of ideas and concepts involved in those courses is almost staggering to consider. Yet the learning resource center must provide instructional media to support learning in all those areas and more.

Purpose

A question seldom asked and even more rarely answered concerns the actual physical characteristics of the instructional media used to facilitate the flow of information in the community college. Are all books alike? Are there differences of some sort among media used to transmit different kinds of information? Are such differences, if in existence, related to physical characteristics?

Because the Microform Project seeks to probe the utility and effectiveness of a medium of information transmission as yet relatively unused in community colleges, a small-scale investigation of physical characteristics of media already in use seemed appropriate.

Two research questions were posed:

(1) What are the physical characteristics of instructional media in the community college library?

(2) Is there an association between physical characteristics of such media and the type of information and/or concepts being transmitted?

Method

Accepting the bibliographies compiled during Phase I as a representative cross-section of media required to meet the institutional needs of community and junior colleges, a sample of media was drawn randomly from each bibliography.

Five titles from each bibliography, representing actual media were selected for a preliminary investigation. The physical characteristics of each were noted on the form shown in Figure 4. Tabulations of dimensions and ranges of values were noted for each subject matter area and a decision was made to sample certain bibliographies more extensively.

The areas of Art Appreciation, Nursing, Life Science, and Mathematics were found, in the initial sampling, to exhibit greater diversity in terms of physical dimensions, illustrative material, type size, etc., than did the other areas sampled. In the subsequent sample, therefore, twice as many media were examined in these four areas as in the remaining six.

Results

A summary of the results of the examination of 133 media is given in Table 12. Although specific type-face for each entry was noted, tabulations were made in terms of "serif:" or "sansserif."

TABLE 12

SUMMARY OF INSTRUCTIONAL MEDIA CHARACTERISTICS

	Range	Mean
Number of Pages	32-2996	373
Width of Pages	4.25-9.25	5.9
Height of Pages	7.0-13.25	8.81
Margin	.375-2.25	.90
Type Size	8-12	
Number of Photographs	0-927	35
Number of Drawings	0-449	39
Number of Maps, Charts, etc.	0-254	16
Number of Color Illustrations	0-341	14
Total Illustrations	0-927	90

n = 133

FIGURE 4

DATA SHEET FOR BIBLIOGRAPHIC ANALYSIS

Citation: _____

_____

1. Type of material: book___newspaper___magazine___other___

2. Required___recommended___available___

3. Number of pages___

4. Subject index___author index___combined index___
   table of contents___

   Footnotes at end of book___at end of chapter or section___
   at bottom of page___

   Bibliography___list of references___table of figures___

   List or table of illustrations___appendix___

5. Physical dimensions of page:_____in.

6. Margin size:_____in.

7. Number of columns per page:_____

8. Text type style_____type size_____point

   Index type style_____type size_____point

   Quote or footnote type style_____type size_____point

9. Number of photographs_____

   Number of drawings or other illustrations_____

   Number of charts, tables and graphs_____

   Other_____

10. Foldouts or other material covering more than one page_____

11. Color graphics_____black and white graphics_____

A correlation matrix was formed to indicate associations, if any, among the various physical characteristics noted. Beyond the obvious associations, such as height, width, and margin size, no correlations of significance were noted.

The question of whether or not differences in physical characteristics could be associated with different subject matter areas was probed by comparing characteristics of media among the ten subject areas represented in the study. The results are given in Table 13.

Interpretation

Aside from the information regarding the physical dimensions of instructional media, the study yielded one significant finding: two main types of information are apparently transmitted by the instructional media examined.

Table K demonstrates the differences in the extent of illustrative materials between two groups of subjects. Although within each subject group, there is an obvious diversity of information and concepts, the characteristics of the instructional media are very similar.

The similarity in content among such diverse courses as Mathematics, Life Science, Art Appreciation, and Nursing is slight. In the other group, what could subjects such as Economics, Spanish, English, Black Studies, Political Science, and Psychology have in common? The conclusion must be that, although actual information and concepts may be diverse among the subjects in each groups, the formal characteristics of the media are quite similar. This suggests that a decidedly greater proportion of the concepts treated in the subject group using much illustrative material are non-verbal, whereas concepts treated in the areas of English, Economics, etc., are largely verbal.

The implication of these results and conclusions for the microform medium is that, if microform is to become an active medium for transmitting information in the community college, attention must be given to the problems related to the pictorial or display function required to transmit non-verbal concepts, as well as to the more customary text representation. The resolution quality of the microform image must be positive, and the amount and dispersion of illumination across the viewing screen must be carefully planned in order that the microform medium itself not introduce interference in the information transmission.

TABLE 15

CHARACTERISTICS OF EDUCATIONAL FIELDS BY SUBJECT

Subject		Number of Pages	Width of Pages	Height of Pages	Margin	Type Size	Number of Photos	Number of Drawings	Number of Maps, Charts, etc.	Number of Color Illustrations	Total Illustrations
Art Appreciation n = 20	Range	149-1016	4.75-9.25	8-12.25	.813-2.75	9-12	0-427	0-449	0-9	2-341	300
	Mean	291	7.11	9.01	1.27		.68	132	-	67	
Life Science n = 11	Range	73-937	4.75-7	6-10	.625-1.25	9-12	0-93	0-145	0-102	0-4	84
	Mean	360	5.73	8.18	.86		10	63	15	-	
Mathematics n = 19	Range	108-913	4.75-6	7.25-9.25	.19-1.0	8-10	0	0-93	0-754	0	30
	Mean	312	5.59	9.01	.82		-	29	30	-	
Nursing n = 21	Range	110-989	5-8	8-11	.625-1.0	10-10	0-154	0-304	0-28	0-317	72
	Mean	351	5.95	8.89	.77		24	55	13	19	
Ethnic Studies n = 4	Range	234-2986	4.25-6	7.25-9	.5-1.125	10-12	0-22	0-94	0-75	0	
	Mean	not calculated because of small n									
Economics n = 10	Range	200-876	5.0-7.75	7.5-9.75	.28-1.5	8-12	0-10	0-9	0-185	0-101	67
	Mean	569	6.5	9.1	.85		1	2	64	10	
English n = 11	Range	144-998	4.75-6.0	7.75-8.75	.5-1.0	10-12	0	0	0-22	0	3
	Mean	419	5.3	8.3	.75		-	-	3	-	
Political Science n = 8	Range	179-756	5.25-7.25	8.0-9.25	.75-2.3	10-12	0	0	0-12	0	2
	Mean	337	5.9	8.3	1.1		-	-	2	-	
Psychology n = 5	Range	164-711	4.25-6.25	7.0-8.25	.5-1.0	10-10	0-170	0-12	0-123	0-1	45
	Mean	354	5.39	8.33	.83		39	1	34	-	
Spanish n = 10	Range	32-540	4.5-6.75	7.75-9.0	.32-1.88	10-10	0-179	0-24	0-12	0-7	32
	Mean	209	5.4	8.4	.84		24	2	1	1	

Appendix B

Library Survey

Microform Project
American Association of Junior Colleges
One Dupont Circle, N.W.
Washington, D.C. 20036

NOTE: In accordance with an agreement reached between the president of your institution and the director of the Microform Project, we are sending this questionnaire which we would like for you to complete and hold for a forthcoming meeting at your campus.

* * * * * * * * * * * * * * * * * * *

1. Please estimate the amount of materials (such as books, journals, and newspapers), excluding films, slides, and audio materials, that pertain to the following subjects:

   a. ecology--

      books ___ journals ___ newspapers ___ other ___

   b. minority studies--

      books ___ journals ___ newspapers ___ other ___

2. How many microfiche readers presently are housed in the library? _____

3. How many microfilm readers presently are housed in the library? _____

4. What microfilm/fiche collections does your library have in use?

   _____

   _____

5. Please indicate general circulation figures (by month or year).

   _____

6. How many electrical outlets are available for microform readers in the library? _____

7. Where are your microfilm/fiche readers located? (If within the library, please indicate location--e.g., adjacent to circulation desk or in room 22 of the basement.) _____

8. What formal lines of communication are available to inform the faculty of the availability of certain materials or equipment acquired by the library? _____

_____

9. How many public or other college libraries are located in your community? _____

10. What are the checkout procedures at your library?

11. How long may students keep materials borrowed from your library?

12. What are the hours kept by your library?

13. Do you have a storage room where a dozen or so large boxed could be kept for as much as a year without interferring significantly with your program?

14. What type of indexing system do you use (Library of Congress, Dewey decimal system, etc.)?

15. Please describe procedures pertaining to reserve reading room and estimate the number or percentage of users per month or year.

16. How do you, personally, regard microforms as a learning resource?

17. If your college is invited to participate in a microform utilization research project, would you (or another librarian) be enthusiastic about such participation?

18. Please make additional comments that you feel would be helpful in deciding whether your institution should participate in the Microform Project.

Director of Institutional Research

(Questionnaire developed and circulated by the Microform Project, American Association of Junior Colleges, Washington, D.C., in an effort to help select Phase III field sites.)

1. What kinds of student records are available at your campus (e.g., SAT, reading comprehension, etc.)?

2. What percentage of your student body are minority students?

3. What percentage of your student body are "disadvantaged" students?

4. How many classes are held off-campus?

5. If a minority study is offered in your curriculum, please indicate the chairman or professor's name and the most recent enrollment figure(s).

6. If an ecology program is offered, please indicate the chairman or professor's name and the most recent enrollment figure(s).

7. How name evening students are enrolled at your institution?

8. Are non-credit reading courses offered? Remedial reading?

9. What kinds of research activities (particularly those instigated by agencies, institutions, or organizations outside your campus community, itself) are underway at your college?

10. Is your college a member of a consortium?

11. To what extent is your faculty resistent to research projects such as proposed by the Microform Project.

12. Which departments, if any, give departmental exams?

13. Please make any additional comments that you feel would be helpful in deciding whether your institution should participate in the Microform Project.

Appendix C

LEARNING RESOURCES ATTITUDE INVENTORY: FORM A

Age_____ Major_____

Sex___(Male, Female) Full-time Student? (yes, no)

Do you wear glasses or contact lenses? (yes, no)

Is this the first time you have taken this course? (yes, no)

What grade do you realistically expect in this course? (A,B,C,D,F,Inc.)

Total number of college credits, including this semester_____

Below are some statements of attitudes or opinions about school, this course, and the learning resources and reading materials available to you for this course. Before each number circle the + mark if you agree with the statement or the - mark if you disagree. Please mark every statement. Think only in terms of this course. Do not try to answer for all the learning resources for all the courses you are taking.

+ - 1. I had no trouble getting material when I wanted it.
+ - 2. The environmental conditions (room, chair, lighting, etc.) under which I read the material were comfortable.
+ - 3. Checkout procedures were a nuisance.
+ - 4. The system by which the materials were made available to me was satisfactory.
+ - 5. The whole process of acquisition of the material, reading, and note-taking was too much trouble.
+ - 6. Not being able to mark on the material (writing in the margin, underlining) made studying and note-taking more trouble.
+ - 7. The physical condition of the reading material was always good.
+ - 8. I would have done more reading if it had been less trouble.
+ - 9. I would like to continue using the same kind of learning resources.
+ - 10. This course was dull and uninteresting.
+ - 11. Getting to the library is no problem.
+ - 12. I like to read.
+ - 13. Courses in this subject usually bore me.
+ - 14. School bores me.
+ - 15. Much of the reading required was trivial and a waste of time.
+ - 16. The teacher did not seem very interested in most of the required reading.
+ - 17. I liked the teacher.
+ - 18. Other students seemed to be able to finish their reading assignments easier and more quickly than I.

I would classify my attitude toward the learning resources for this class as: (underline one) very favorable, favorable, neutral, unfavorable, very unfavorable.

LEARNING RESOURCES ATTITUDE INVENTORY: FORM B

Below are some statements of attitudes or opinions about school, this course, and the learning resources and reading materials available to you for this course. Before each number circle the + mark if you agree with the statement or the - mark if you disagree. Please mark every statement. Think only in terms of this course. Do not try to answer for all the learning resources for all the courses you are taking.

+ - 1. I have no objection to the checkout procedures.
+ - 2. The physical condition of the reading material was frequently poor.
+ - 3. The process of acquiring the material, reading, and note-taking was easy.
+ - 4. The environmental conditions (room, chair, lighting, etc.) under which I read the material were not comfortable.
+ - 5. I could have studied more effectively if underlining and writing in the margins had been possible.
+ - 6. The system by which the materials were made available to me was generally unsatisfactory.
+ - 7. I would not have read much more under any circumstances.
+ - 8. I find it difficult to get to the library.
+ - 9. I do not like to read.
+ - 10. I usually enjoy courses in this subject.
+ - 11. I hope the learning resources will be improved.
+ - 12. I enjoyed this course.
+ - 13. Getting material when I wanted it was often a problem.
+ - 14. I did not like the teacher.
+ - 15. I like school.
+ - 16. Much of the reading required was very difficult.
+ - 17. It was difficult to keep up with the discussion in class without having done the reading assignment.
+ - 18. I usually finished my reading assignments before other students and with less trouble.

I would classify my attitude toward the learning resources for this class as: (underline one) very favorable, favorable, neutral, unfavorable, very unfavorable.

Appendix D

EQUIPMENT USED AT MOUNT VERNON COLLEGE LIBRARY*

3M FILMAC 400 Microfilm Reader
Xerox 1212/17 X Microform Reader
Xerox 1013 Microfilm Reader
Xerox 1414 Reader
NCR (PCMI)
K & E Micro-Master Document Viewer 11
NCR 456-4 Microfiche Reader
MICRA/210 Microfiche Reader
Dietzgen 4319 Microfiche Viewer
Readex Universal Micro-Viewer
Atlantic F-66 Microfiche Reader
Canon 150 Microfiche Reader
K & E 9949 Micro-Master Micro-Viewer
DASA Microfiche Viewer (Portable)
Atlantic Microfiche Reader (Portable)
WS-1 Microfiche Reader (Portable)
Recordak Motor-Matic
Recordak (Fiche)
Remkard Unit
Electric Automatic Recording Units (Counters)
Information Design Reader Model 201
Information Design Model 105 Loader
Information Design Convertor for 3M 400
35mm. Cartridges
35mm. Carrousels for Storage
DIOPTRIX COM-1 40X Reader
XIDEX 340VC Printer
XIDEX 360VS Developer

*Equipment used in other pilot studies is described in the narrative portion of this report.

Appendix E

MICROFORMS AVAILABLE AT MOUNT VERNON COLLEGE

I. CURRENT PERIODICALS

A. NewsBank Urban Affairs Library

Newspaper articles, selected from 150 national papers, dealing with urban affairs primarily, divided into 12 major subject categories: education, employment, environment, government structure, health, housing and urban renewal, law and order, minority economic development, political development, race relations, transportation, and welfare and poverty. Collection is updated monthly, and is indexed.

B. Bell & Howell Micro-Photo Division

Complete volumes for 1969 and 1970 of Time, Life, Newsweek, and Sports Illustrated. Black and white film, only.

II. BACK PERIODICALS

A. Black & White (League of American Writers)

One of the "radical periodicals in the United States," published monthly in two volumes between 1939-40. Deals with underground reactions of the period to American social conditions as well as the development of letters.

B. Ecological Monographs, vols. 1-13. 1931-1943

A journal of "all phases of biology," published by the Ecological Society of America.

C. Ecology, vols. 1-25. 1920-1944

Articles deal with all forms of life in relation to environment.

D. Industrial Pioneer, vols. 1-4. 1921-1926

Deals with the organizational conditions as well as the ideas of a group that "had once been the most radical and most feared labor organizations in the U.S."

E. Journal of Negro History, vols. 1-29. 1916-1944

Quarterly journal, published by the Association for the Study of Negro Life and History, whose purpose is to "collect historical manuscripts and materials relating to the Negro throughout the world, and bring about harmony between the races by interpreting the one to the other." (The journal is indexed in the Social Science & Humanities Index.)

III. STANDARD WORKS

A. PCMI Educational Products

Thirty-five standard references in political and social science contained on five ultrafiche. The five titles are: "Criminology and Criminal Anthropology," "The Modern State-16th Century," "Penology," "Sociology (I)" and "Sociology (II)."

B. Readex Microprints

Facsimile editions of major as well as minor extant plays from respective periods in America and Britain, including Pre-Elizabethan, Elizabethan, and Early Restoration drama. The collections, entitled "Three Centuries of Drama - English (1500-1641)" and "Three Centuries of Drama - American (1714-1830)," are arranged alphabetically by playwright and indexed in a cloth volume edited by G. William Bergquist. Another collection, entitled "International Conference on Peaceful Uses of Atomic Energy," vol. 1-13, consists of complete recordings of an August 1955 conference which was labeled "a unique achievement in scientific co-operation on the international level." Proceedings conducted and published by the United Nations (pub. 1956).

C. NCR Slavery Source Materials

Annotated bibliography of contemporary documents concerned with slavery and abolition is contained on four microfiche. Three complete works listed in the bibliography are:

1. Adams, Francis C. Uncle Tom at Home. A review of the reviewers and repudiators of Uncle Tom's Cabin by Mrs. Stowe. 1853 142pp.

2. Adams, Nehemiah. The sable cloud: a southern tale, with northern comments. 1861.

3. Adams, Nehemiah. A south-side view of slavery; or three months at the south, in 1854. 1954. 214pp.

Appendix F

The following questions relate to your use of the Micro 8 viewer in your overseas Shakespeare class. Please mark the responses you feel are most appropriate for you. If you experienced any mechanical trouble, the manufacturer would like to know about it; if you experienced other problems, we would like to know about them. We appreciate your cooperation in this study and we hope your learning experience has been a richer one because of it.

1. Have you had any mechanical trouble with the reader?

__lamp burned out

__illumination of screen

__focus

__motor operation or control

__cassette

__damage to reader

2. Have the screen and lens been difficult to keep clean?

__yes (screen, lens)

__no (screen, lens)

3. Has the reader created any special problems in your room? (Space required; distractions from or to other persons; proximity to outlet, etc.)

__yes (specify)

__no

4. Do you feel that your studying requires more time or less time as a result of using the reader?

__more

__less

5. Do you feel that you have become pretty much accustomed to using the reader (including locating the reading assignment)?

__yes

__no

6. Do you feel that having the material available to you for study and research has made your overseas learning experience richer than it would have been without the availability of these readings?

__yes

__no

7. Underline the word(s) most descriptive of your reaction to the microfilm presentation of your reading resources.

very favorable, favorable, neutral, unfavorable, very unfavorable

8. Would you have preferred to use only the library facilities available to you in England?

___yes

___no

9. If more extensive learning resources were made possible through the use of microforms such as you have used, would you be likely to take advantage of them?

___yes

___no

10. What suggestions could you make to improve the use of microforms in college?